

MEDIA IDENTIFICATION

This invention concerns the identification of audio, video, audiovisual and multimedia information.

With the increasing use of information technology in the preparation of film, television and audio production it has been recognised that a method of labelling audio and video signals and recordings gives significant productivity benefits. A number of systems have been defined, including the "Unique Material Identifier" (UMID) described in SMPTE Standard 330M-2000. There are known ways of associating such identification information with audio or video, or "embedding" the identification into the audio or video signals or data. As well as identifying the signal or data the label (tag) can be used to create an association with a file of "metadata" containing a wide range of information about the tagged material.

A tag will usually identify a particular temporal segment of the material, such as a video "shot" and therefore the tags will change many times as a sequence is played or streamed out.

In an audio or video production process material will pass through various types of processing equipment; sometimes the material will pass unchanged, but often the equipment will modify the material. For example the dynamic range of an audio signal may be changed or the framing of a video signal may be altered. It is important that, where the material has been changed in this way, any associated tag and metadata are updated so that the altered (output) material can be easily differentiated from the unaltered (input) material. This can be achieved by providing the processing equipment with the means to alter the embedded or associated tag as well as processing the audio or video.

This can be difficult to implement because new, and unique, tags have to be ready for output as soon as an operator makes a change to the process or the input moves from one temporal segment to another.

The inventors have appreciated that there is an improved and novel solution to this problem.

The invention consists, in one aspect, in a video, audio, audiovisual or multimedia processing device having a store for one or more output identifiers

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capable of being associated with or embedded into the processed output, wherein a change in the nature of the processing results in an identifier being taken from the said store and associated with or embedded into the processed output.

5 In another aspect the invention consists in a video, audio, audiovisual or multimedia processing device having a store for one or more output identifiers capable of being associated with or embedded into the processed output, wherein a change in an identifier associated with or embedded into the input video, audio, audiovisual or multimedia material results in an identifier being taken from the said store and associated with or embedded into the processed output.

10 Advantageously the store can be loaded via a unidirectional or bi-directional control interface. The store is preferably loaded from a central computer which manages distribution of identifiers to the processing device

Alternatively the store can be loaded via a data path associated with or embedded in the processor's video, audio, audiovisual or multimedia input.

15 In a further aspect the invention consists in a video, audio, audiovisual or multimedia processing device having a data input for data associated with or embedded in the said processor's video, audio, audiovisual or multimedia input and a data output for data associated with or embedded in said processor's video, audio, audiovisual or multimedia output, characterised in that the said data inputs  
20 and outputs carry identifiers to be used to identify future processed versions of the processed video, audio, audiovisual or multimedia material.

In a further aspect the invention consists in a video, audio, audiovisual or multimedia processing device having a store for one or more output identifiers capable of being associated with or embedded into the processed output, wherein  
25 one or more of the stored identifiers that has not been associated with or embedded into the processed output is output on a data channel associated with or embedded into the processed output.

In yet further aspect the inventions consists in a video, audio, audiovisual or multimedia signal or file having associated with it or embedded in it a sequence  
30 of identifiers to be used to identify future processed versions of the said signal or file.

In preferred embodiments of the invention, the processing device is provided with synchronisation information. Each time a new identifier is taken from the store synchronisation information can advantageously be associated with the new identifier. By reporting this synchronisation information back to the central computer it is possible to maintain a record of the time at which a particular media signal or media segment was processed by a particular device. The central computer may maintain a record of the processing device associated with identifiers as they are distributed, or alternatively the identification of a processing device for an identifier may be reported back to the central computer.

Synchronisation information may include, for example, time of day, timecode or presentation time stamps, and the format of this synchronisation information may usefully be made application specific.

Preferably devices report back synchronisation values as differential time values in order to reduce traffic on the control path.

The invention is applicable to single or multi-channel, audio, video, audiovisual or other multi-media processing. The input and output of the process may be carried by:

- Real-time or non-real-time analogue or digital signals;
- Streaming data;
- Files delivered over a communication medium; or,
- The physical transfer of recording media.

An example of the application of the invention to a video or audio process will now be described with reference to the drawings in which:

Figure 1 shows a single-stage process according to an embodiment of the invention.

Figure 2 shows a multi-stage process according to a further embodiment of the invention

Referring to Figure 1, a video signal (1) is input to a processing device (2), which delivers a processed output (3). The processing device (2) has a control input (4), which causes the nature of the processing to be changed, in response to an operator or some automated controller (for example an edit controller).

Associated with the video input (1) there may be an identification input (tag) (5). This is shown as a separate input, but more usually the tag, if present, would be embedded in known manner into the video signal. The signal (5) enables the video signal (1) to be identified, and it may vary so as to identify different temporal segments of the video.

In a similar way, there is an identification signal (tag) (6) associated with, or embedded into the output signal (3). Where the processor (2) merely duplicates its input (1) and presents it unchanged at the output (3), the output tag (6) is made identical to the input tag (5). If there is no input tag (5) the processor will provide a tag and output it at (6).

If the processing is changed in response to the control input (4) the output tag will also need to change.

It is important that the new tag is unique and is co-ordinated with the tags inserted by other processing devices. These functions are carried out by a central computer (7) which is connected to the processor (2) by a data link (8). This link can usefully be a network which connects to other processing devices.

The computer (7) downloads tags to the processor (2) via the link (8) prior to their being required for use. They are stored in a sequential store (9) in the processor (2) and when a change in the processing is made in response to a control signal (4), the next tag from the store is sent to the output (6). This action can be reported to the central computer (7) via the control connection (8).

This arrangement simplifies the processing of tags in the processor (2); it does not need to be able to generate tags, only to store and use them appropriately. A further advantage is that the traffic on the control path (8) is minimised; once the tags are loaded into the store (9) the values of new tags used need not be reported explicitly; only a "next tag used" message or a short tag identifier need be sent.

In a preferred embodiment, synchronisation information is additionally sent to the processor (2) from the computer (7), to allow the processor to associate timing information with each tag.

A further embodiment of the invention is shown in Figure 2. Here a video (or audio or multimedia etc.) signal (200) with an associated or embedded

identifying tag (201) is processed in a cascaded chain of processing devices (202) (203) (204) to give intermediate signals (205) (206) and a final processed signal (207). These three signals have respective embedded or associated identification tags (208) (209) (210).

5       The first processing device (202) has the capability of storing tags delivered via a link (211) in its tag store (212). The other, downstream, devices may or may not be connected to a control and monitoring network, but they do not receive tags via such a network. These downstream processors (203) (204) carry out various respective fixed and unchanging processes, that is to say their  
10       processing parameters are not under varying control by an operator or automation system. The output signals from these processors need to be identified, but the output tags only need to change when the input tags change (as a result of shot changes for example).

      The first processor (202) has, in addition to its processed output (205) and  
15       its tag output (208), a data output (213). This carries a sequence of unused tags from the store (212) in the processor (202), the number of tags in the sequence being at least as great as the number of downstream processors (203) (204). This data can usefully be embedded into the signal (205), together with the tag (208) so that it follows the path of the signal (205) into the next processor (203). In an  
20       embodiment where synchronisation information is associated with tags, synchronisation information need only be provided to the first processing device (202). The first processing device can associate synchronisation information with tags passed to downstream devices (203) (204) to be used by those downstream processors. This may simply be by assuming simultaneous processing by  
25       downstream devices, or by reference to a processing delay.

      The processor (203) has a tag store (214) which is loaded from the data path (213). The processor (203) monitors the input tag from (208); when this tag changes it is necessary to change its output tag (209). The new tag is taken from the tag store (214).

30       The processor (203) also has a data output (215), analogous to the output (213) from the processor (202). This carries a sequence of unused tags for use by subsequent processing devices such as (204).

The processor (204) works in the same way as its predecessor and has a tag store (216) loaded from the data path (215), and a data output (217) carrying unused tags to any subsequent downstream processors.

5 The distribution of tags for use in a cascaded processing chain may be summarised as follows.

- Sequences of tags are generated prior to use in a central computer and downloaded in batches via the link (211) to the store (212) for use at the output of the processor (202).
- At least part of a sequence of unused tags in the store (212) is output on the data path (213) and some or all of these are stored (214) in the processor (203).
- The processor (203) outputs at least part of the unused sequence of tags on the data path (215) for use by subsequent processors.
- Processors (203) and (204) replenish their stores from their respective data inputs (213) and (215).

15 When a processor sees a change in its input tag it replaces its current output tag with a tag taken from its store. The tag stores in the downstream processors (203) (204) can be of any convenient size. It is even possible to have no storage at all and just to use the first tag at the data input and to remove that tag from the data output.

20 Suitably, the system acts to co-ordinate the tag storage and use algorithm with the tag generation process; and also to ensure that tags which have been used do not remain in a store where they may be re-used by mistake.

In one specific application, the invention is used to embed a Unique Identifier such as a UMID (SMPTE Unique Material ID) into the Ancillary Data Space of a Serial Digital Interface (SDI) in either Standard Definition or High Definition. Processing devices maintain a list of UMIDs which are given by a central host computer. When a change of UMID is identified at the input of a processing device, a new UMID is taken from its store and some or all of the following information is reported back from the processing device to the central computer:

- the new UMID
- the number of UMIDs left in the store

- the old UMID
  - the serial number (or other ID) of the processing device
  - the timecode in the SDI stream
  - the time of day when the UMID was applied
- 5    -any unique frame count present in the SDI stream
- By managing the distribution of UMIDs intelligently the amount of data reported back can be reduced as follows:
- the old UMID need not be reported if the upstream device is part of the same system since this UMID will be known from the output of the upstream device.
- 10   - the new UMID need not be reported as it can be registered at the host computer when it is downloaded to the processing device.
- the serial number of the device may already have been reported and can be associated with the processing device's "send" network address.
  - In certain applications the timecode of the stream, unique frame count and the
- 15   time of day will be synchronised rendering at least one of these information fields redundant.

In an embodiment which takes advantage of all of these data reduction methods, the remaining minimum data to be sent is the number of UMIDs in the store & timecode.

- 20   The process is extensible for other unique numbers such as ISAN (ISO - International Standard Audio-Visual Number) or V-ISAN (Versioned ISAN) or UPID(Unique Program ID) or any locally defined identifier used by an organisation.

It will be appreciated by those skilled in the art that the invention has been

25   described by way of example only, and that a variety of alternative approaches may be adopted without departing from the scope of the claims. For example processors receiving tags embedded in their audio or video input might have operator control of their processing parameters and need to change their output tags due to process changes initiated by an operator.